

“An Oversight Hearing on Whether Halliburton Has Failed to Provide Clean Water to United States Troops in Iraq”

Jeffrey K. Griffiths, MD MPH&TM
Director, Global Health
Tufts University School of Medicine

Good Morning, I am Dr. Jeffrey K. Griffiths, of Tufts University School of Medicine in Boston. By training and practice I am an infectious diseases physician with an expertise in diseases of the tropics, and in particular diarrheal diseases. Because of my expertise in drinking water contamination, I have the privilege of serving on the National Drinking Water Advisory Council and the Science Advisory Board of the US EPA. I have worked in developing countries such as Bangladesh, Haiti, Ecuador, and Kenya professionally for more than 20 years, and am intimately familiar with the health effects of water contamination. Through my training and experience, I have direct knowledge of, and experience in, the treatment of these conditions. I appreciate this opportunity to testify today.

In preparation for this testimony, I was asked if I had any diagrams or photographs for the committee. With all due respect, I don't think the things I would should you are very pretty, and with your permission I will forgo those.

The importance of not drinking sewage.

Everyone knows that drinking, or washing with poop is bad for you. The reasons are so obvious we consider them common sense.

We use water to hydrate ourselves and to clean our bodies. When water is contaminated with pathogens, we become infected with bacteria, viruses, or parasites. These organisms can enter our bodies to cause mischief when we drink them, or allow them to enter through cuts in our skin or if we put them on our eyes. People with inadequate or poor water develop diarrheal diseases, hepatitis and polio as they are also spread through water, skin infections, and eye infections.

Diarrheal diseases. Intestinal diseases such as cholera and dysentery were common in the United States an hundred years ago, in large part due to contaminated water. Ten percent of infants in Boston in 1900 died of summer-time diarrhea every year. The long lifespan that we now enjoy in the United States is primarily been due to the provision of clean water, clean food, and sanitation over the past century. By sanitation I mean that our feces do not contaminate our water supplies. By clean water, and clean food, I mean that our food and water do not have feces in them. The key to these advances is that we no long drink, eat, or bathe with poop in it. The average person today can look forward to a lifespan of perhaps 78 years; a century ago it was 48, when water borne diseases were common.

If we did not work to keep our water clean, primarily by keeping human wastes out of what we drink and use for personal hygiene, then we will return to the bad old days of a century ago. Our wastes still contain the germs excreted by people ill with various diseases, and these can still

serve to infect our population. Recent outbreaks in the United States and Canada, linked to breakdowns in treatment, confirm this potential.

Iraqi River water is contaminated with sewage

Cholera and dysentery are common diseases in Iraq. Before the first Iraq war, the condition of the Euphrates river was described “poor,” with contemporaneous documentation of high rates of diarrheal diseases – including cholera and dysentery – from untreated water. In a 1991 a Central Command assessment of Iraq water treatment stated that, “Iraq’s rivers also contain biological materials, pollutants, and are laden with bacteria. Unless the water is purified with chlorine epidemics of such diseases as cholera, hepatitis, and typhoid could occur.” The situation deteriorated between 1991 and today, and modern accounts of the Euphrates describe the river as essentially an open sewer. Similar to parts of the US a century ago, rates of water borne diseases like cholera, typhoid, polio, and hepatitis were very high.

The committee should have no doubt that exposure of our troops to untreated river water in Iraq is highly hazardous to their health. By analogy, you could bathe and drink the water at your local town’s sewage outfall and get a picture of this.

Furthermore, by taking water below a sewage pipe discharge point, one ensures that the water is even more heavily contaminated with the pathogens that cause diarrhea and dysentery. Standard practice, of course, for decades around the world has been to make sure that your source water for drinking is taken from a river far above the place where your wastes and sewage are discharged. To do otherwise flies in the face of common sense.

According to documents provided to me by Committee Investigators, water for our soldier’s use was taken from the Euphrates River. According to an internal Halliburton/KBR report, water for the Ar Ramadi base was “undoubtedly” obtained within 2 miles of sewage outfalls, thus maximizing the load of human pathogens in the water. We are also informed that the water given to soldiers for bathing and other uses was the concentrated waste water from the osmosis units, which would have in fact *increased* the pathogen loads in the Euphrates water, and that this water was not filtered to remove parasites, nor chlorinated to kill bacteria and viruses. At a minimum, this water should have been chlorinated, and filtered as well to remove the cysts of parasites like *Cryptosporidium*, *Giardia*, and dysentery-causing amoebas.

The numbers of illnesses, their severity, and so on depend upon the relative degree of contamination of the water. Most US citizens, by the way, ingest some water while showering or brushing their teeth, and certainly inhale some of aerosolized water during showering. Some viruses and bacteria lead to cramping abdominal pain, watery diarrhea, and dehydration, like cholera or Salmonella infections. Other pathogens lead to bacteria invading the body through the intestine, causing severe pain and intestinal bleeding; we call this pooping-of-blood dysentery. In many if not most wars, diseases like dysentery killed more soldiers than battle. Diarrhea and dysentery require antibiotic treatment most of the time, as well as an attention to hydration status. A minority of affected people will need more complex medical care, such as dialysis, to recover from these infections. Other relevant illnesses include common ones such as hepatitis A,

an inflammation of the liver that causes jaundice, typhoid, which causes weeks of fever and intestinal bleeding, or ones like leptospirosis that come from rat urine and feces.

Showering with contaminated water exposed all of your skin to the organisms found in the contaminated water. Some pathogens can gain entry into the body through any cuts or abrasions in the skin, and some may gain entry through minor or involuntary ingestion. Skin infections with fecal bacteria, or even the common ones such as *Staphylococcus* or *Streptococcus*, can occur. Some of these organisms are popularly known as the "skin-eating" or "flesh-eating" bacteria, so these infections can be quite significant.

Of importance, the use of contaminated water will lead to eye infections from both bacteria and viruses. Many viruses, such as adenoviruses found in sewage, are important causes of eye infections. A soldier that cannot see cannot defend himself or herself and cannot partake in his or her usual duties.

Summarized Medical Consequences

These medical consequences are easy to understand. The majority of people who shower will ingest some amount of the water, use some to clean their faces, and use it to wash out cuts and abrasions. Many of the ingested bacteria and some of the parasites will cause acute diarrhea, dysentery, and typhoid. These illnesses lead to significant disability and even death. The list of symptoms to be described for diarrhea alone include diarrhea, vomiting, nausea, stomach cramps, muscle cramps, headaches, fevers, dehydration.... And it gets worse from there, including bloody diarrhea and loss of one's intestines. Other illnesses include hepatitis and polio, which thankfully we have good vaccines for. Water with poop in it that gets into the eyes will cause painful eye infections, or conjunctivitis. Water with poop in it that gets into cuts, abrasions, or other skin sites will cause skin infections that can range from minor, to ones with flesh-eating bacteria and blood poisoning. These infections can be lethal. The Halliburton/KBR report itself notes that "the consequences of these actions could have been VERY SEVERE resulting in mass sickness or death."

Similarly, the occasional use of water from an unlabelled faucet, or the practice of brushing one's teeth in the shower, would have further exposed our soldiers to these risks.

We also know now from recent science that many of the emerging pathogens found in water, such as *Cryptosporidium* and some of the *E. coli* bacteria, can infect us with amazingly low numbers of the pathogens. Thus, the use of unchlorinated and untreated water for purposes other than drinking can still mean that these bad pathogens can reside on your clothes or the surfaces you touch, and then be ingested via causal hand to mouth contact. In my opinion, it is likely that the concentrated Euphrates water used to wash a variety of equipment is so contaminated, it should at least be chlorinated to reduce the likelihood that all the military equipment and surfaces will be covered with a layer of sewage.

In summary, the source water used for our soldiers at Ar Ramadi was highly polluted and completely unacceptable by any standard without robust treatment. In what appears to be a profound misunderstanding of the way a reverse osmosis unit works, concentrated untreated

polluted water was provided to our soldiers for hygienic purposes that is highly likely to make people sick. They would have been better off being provided with water straight from the Euphrates River. Remedial action that was undertaken did not include filtration, solely chlorination, even though internal staff recommended its use.

The principles of drinking water treatment, and its association with human disease, have been known since the 1800s. These principles were ignored and exposed our troops to infectious diseases risks that are at times lethal. Because of a lack of monitoring and surveillance of the water systems, we do not know the exact details of how long and how badly the water was contaminated, although the internal investigators at Halliburton/KBR supposed at least a year. Had we this knowledge, a proper epidemiological study to quantify and measure the effects of the water contamination could have been conducted. When water is as contaminated as this, we usually find that the people receiving the water have elevated rates of illness, but sometimes without the appearance of an epidemic. That is because they are exposed all of the time, not just some of the time, and there is no way to compare a low exposure period to an high exposure period.

I urge that these unhygienic, antiquated practices be stopped and that proper monitoring and surveillance for these illnesses be put into place. Thank you for your time.